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## Woodward-Clyde Consultants

February 8, 1991

E.H. Wilson  
EG&G Rocky Flats Inc.  
P.O. Box 464  
Golden, CO 80402-0464

Re: Geotechnical Evaluation of Cold Weather Construction Concerns,  
Decontamination Pad for OU2 Alluvial RFI/RI,

Dear Mr. Wilson:

We understand there are concerns about constructing the equipment decontamination facility that will be used during the Operable Unit 2 RFI/RI field activities on frozen soil. This letter presents the results of a geotechnical engineering evaluation of the plans and specifications for the decontamination facility with regard to potential risks associated with constructing on frozen ground.

The equipment decontamination facility will be constructed at or above the existing grade after placing a layer of structural fill. A concrete pad on which equipment and vehicles will be decontaminated will be underlain by approximately 2-4 feet of compacted structural fill. The pad will be provided with drainage collection features and plumbing to remove decontamination wash water to sedimentation, holding, and storage tanks. The entire facility will be underlain by a secondary containment system consisting of berms lined with a high-density polyethylene (HDPE) liner over a geotextile fabric. The facility will be located in an existing gravel-covered driveway area south of the 903 Pad. Water storage tanks associated with the facility will be a maximum of approximately 6-8 feet in height, which will result in a foundation surcharge pressure up to about 500 psf. The plans indicate the tank foundations will be placed near the existing grade.

We understand there are some concerns with constructing the decontamination facility above frozen soil. Conventional construction practice is to remove frozen soils prior to placement of new fill or foundations during winter construction. However, it is desired

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to avoid excavation of the onsite soils since there is a potential for them to be contaminated. Therefore, if the decontamination facility is to be constructed before the ground thaws in the spring, it will be constructed above frozen ground.

In general, it is not considered good construction practice to place fill above frozen ground. The reason for this is that soils with moisture in them tend to expand when they freeze. Therefore, if fill or a structure is placed on them while they are frozen, settlement can occur when the soils thaw. However, the amount of expansion that occurs upon freezing depends on the soil type and moisture content. Saturated, fine-grained soils can expand significantly upon freezing. Since water undergoes an approximate 10% increase in volume when it freezes, a saturated soil with a porosity of 40% will expand approximately 4% upon freezing. However, an unsaturated soil will tend to expand much less when it freezes since much of the volume expansion of the soil moisture will occur in air spaces in the soil voids and the overall soil skeleton will expand very little, if any.

The natural soils in the area of the proposed decontamination facility consist of the Rocky Flats Alluvium, which is composed primarily of silty to clayey sand and gravel. Some granular fill may have also been placed in this area for the driveway. The undersigned visited the site February 7, 1991 to observe surface drainage and moisture conditions. With the exception of a small snow drift on the north side of an existing trailer occupying the site, the entire ground surface was dry. Surface drainage conditions were generally good and no puddles were observed. However, several small depressions no more than a few feet across were observed where puddles could develop during rain or snow melt.

We understand that EG&G excavated a small pit to test the moisture content of the soil at the location of the proposed decontamination facility. They found that the minus No. 4 sieve fraction of the soil had a moisture content of approximately 8%. Considering the gravel content of the soils, this represents a moisture content well below the saturation moisture content for this soil. Although the soils in the pit were frozen to a depth of approximately 1½ feet, considering the moisture content, it is highly unlikely that they have undergone any significant expansion as a result of freezing.

Considering the above discussion, we believe the added risk of constructing the decontamination facility on frozen ground is low. Additional settlements that occur due to thawing should be unnoticeable. As a precaution to limit potential differential settlements, we recommend that at least 1 foot of compacted granular structural fill be

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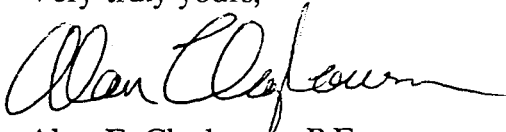
placed beneath the foundations for the tanks. This may require that the entire grade of the decontamination facility be raised approximately 1 foot. Prior to placement of fill, all snow and ice should be stripped from the area.

If when fill placement commences, the site is in the same condition observed on February 7, we do not believe any preparation of the subgrade will be required. However, if snow and snowmelt result in puddles in critical areas, such as beneath tank foundations, these localized areas should be prepared for fill placement. Subgrade preparation should provide a firm, uniform subgrade on which to place fill. This may involve tenting and heating to thaw the soils and then working 1½-inch crushed rock into the wet spots by wheel-rolling with a large pneumatic-tired vehicle such as a front end loader. This will provide a suitable surface on which to place structural fill. The requirement for such measures may be avoided by removing all snow from the area before it is allowed the melt.

We are available to observe the site again immediately prior to site grading to evaluate whether or not any preparation of the subgrade will be required. Based on the conditions observed, little, if any, preparation will be necessary.

If you have any questions, or if we may be of further assistance, please contact me at (303) 740-2700.

Very truly yours,



Alan F. Claybourn, P.E.  
Project Manager

AFC:lss

(1 copy sent)

1c: Mr. Jim Koffer, EG&G  
Mr. Tom Greengard, EG&G  
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